REMARKS

Claims 1, 3-6, 9-10, 12-14, 19-21, 32-34 and 36-40 were pending in the application. New Claims 41 and 42 is presented herein. Accordingly, Claims 1, 3-6, 9-10, 12-14, 19-21, 32-34 and 36-42 are now pending in the application. The features of Claims 41 and 42 are disclosed throughout the specification, claims and drawings of the originally filed application. Claim 38 is amended herein for minor reasons. Therefore, no new matter has been added. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendment and remarks contained herein.

If the Examiner relies on a new ground of rejection or a new reference in rejecting the claims in the next Office Action, a Final Office Action would not be appropriate since the amendment to dependent Claim 38 is minor and only states explicitly that which was implicit. Further, because the independent claims have not been amended, any new rejection of the independent claims could not have been necessitated by Applicant's amendment.

Under present practice, Office Actions where the Examiner introduces a new ground of rejection shall be final only when the new ground of rejection is necessitated by Applicant's amendment of the claims. *See* MPEP § 706.07(a).

REJECTION UNDER 35 U.S.C. § 112

Claims 10, 12-14, 19, and 38 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. This rejection is respectfully traversed.

With respect to Claims 10 and 12-14, the Examiner alleges that "the step of determining a loop time of a thermal model of said friction device is not found in the

specification". Applicant respectfully disagrees and submits that this is contradictory to the Examiner's statement on page 8 of the Office Action. On page 8 of the Office Action, the Examiner admits that in paragraph [0027] of the application, loop time Δt of a thermal model is disclosed.

The term "loop time" is disclosed in the application and would be readily understood by one skilled in the art. In paragraph [0027], Applicant recited a loop time Δt of a thermal model. Applicant also provided an example loop in FIG. 2, which is identified and described in paragraphs [0032]-[0034] of the application.

A loop time refers to a period of time to perform an iteration of multiple tasks. See the example loop of FIG. 2 of the application. A loop time of a thermal model may refer to the time to perform the tasks of or related to the thermal model. As an example, a thermal model such as that disclosed in the application includes multiple parameters, which are iteratively determined. Each of the iterations may be referred to as a loop. Thus, the time to perform a single iteration is the loop time of that iteration or loop. As another example, FIG. 2 of the application illustrates a method that includes using a thermal model and involves iteratively performing steps 104-112. The time to perform one iteration of the steps 104-112 may be referred to as a loop time of a thermal model.

The term "loop" refers to a single execution of a set of instructions or iteration that is repeated. See, for example, Google definitions. Thus, loop time refers to the time to perform a set of instructions or iteration.

In the Office Action of December 1, 2009, the Examiner alleges that Applicant has not defined the term "loop time" in the application. In the Response of January 29, 2010, Applicant provided an example definition of the term loop time. Applicant stated

that the loop time may be the time to perform one iteration of the steps 104-112 of FIG. 2. Also, it is not necessary to define the term "loop time", as this term is known in the art. Referring to MPEP 2164.08, "not everything necessary to practice the invention need be disclosed. In fact, what is well-known is best omitted." *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991).

On pages 8 and 9 of the current Office Action, the Examiner alleges that the specification does not state that the loop time Δt of the thermal model is the time associated with performing steps 104-112 of FIG. 2. Regardless of whether the specification explicitly states that the loop time Δt is the time to perform steps 104-112, paragraph [0032] of the specification discloses that the thermal model is used to estimate a friction device temperature. Paragraph [0033] of the specification further states that "control loops back" and thus the steps of FIG. 2 are performed in a loop. The time to perform the steps of FIG. 2 is one example of a loop time. Thus, the definition of a loop time would be clear to one skilled in the art, especially in view of the application.

With respect to Claim 38, the Examiner alleges that the units of J/°C and W/°C are not in the specification. Claim 38 is amended to recite "units of energy per units of temperature" and "units of power per units of temperature". Units of energy per units of temperature is the units of measure for thermal inertia. Units of power per units of temperature is the units of measure for heat rejection.

The units of measure of Claim 38 are consistent with the relied upon reference of U.S. Pat. No. 5,319,963 ("Benford") and with the referred to reference of U.S. Pat. No. 6,179,096 ("Kinerson"). On page 8 of the Office Action the Examiner admits that

Benford discloses the units of measure of thermal inertia to be BTU/°F. The Examiner further admits that BTU/°F and J/°C are equivalent, where one is in English units and the other is in SI units.

Also, on page 8 of the Office Action the Examiner admits that Benford discloses heat rejection units of BTU/hr and Kinerson discloses heat rejection units of BTU/min. BTU/hr and BTU/min are essentially equivalent to Watts (W). 1 Watt is equivalent to 1 J/1 sec. 1 BTU is equivalent to 1.06 kilojoules. Thus, the equivalent units of measure to Watts (W) is BTUs/sec. This is essentially the same as BTU/min and/or BTU/hour, where the units of measure are units of energy per units of time.

In addition, BTU/hr and BTU/min are not completely accurate notations for heat rejection, but rather are short hand forms of the units of measure for heat rejection. Heat rejection refers to a rate at which a device releases heat for a particular temperature. Thus, a more accurate notation for heat rejection is units of power (e.g., W or BTU/hr or BTU/min or BTU/sec) per units of temperature (e.g., °C or °F). Heat rejection in its short hand form may be described as units of power alone. Nevertheless, the notation previously provided by the Applicant and the recitation of units of power per units of temperature are correct, are accurate, are consistent with the stated references, and would be clear to one skilled in the art.

Therefore, regardless of whether the units of measure for thermal inertia and heat rejection are explicitly recited in the application, this would be evident to one skilled in the art.

Claims 1, 3-6, 9, 10, 12-14, 19-21, 32-34, and 36-40 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. This rejection is respectfully traversed.

The Examiner alleges that the terms "thermal inertia", "heat rate", "heat rejection", "loop time" and "thermal energy" are not defined in the specification. Applicant submits that these terms are used and known in the art and explicit definitions of these terms in the specification are not necessary. The definitions of heat rejection and loop time are provided above.

Thermal inertia or thermal mass refers to the product of mass of a body and the specific heat capacity for the material of that body, and typically has a unit of measure of joules (J)/°C. Thermal inertia refers to a measure of thermal mass and the velocity of a thermal wave which controls the surface temperature of a material or body. Thermal inertia is the square root of the product of a bulk thermal conductivity and volumetric heat capacity of a material or body. See, for example, Wikipedia the free online encyclopedia.

Heat rate or heat transfer rate refers to the amount of thermal energy transferred for a unit of time. The units of measure for heat rate are Watts W or J/sec. Thermal energy or internal energy refers to the total of the kinetic energy and the potential energy of a device. The SI units of thermal energy is J/kg. See again Wikipedia the free online encyclopedia for definitions of heat rate and thermal energy.

As the above provided term definitions are known in the art, the definitions do not need to be explicitly stated in the application. Again see MPEP 2164.08.

The Examiner also appears to allege that the expression $\frac{H_R}{K_{diss}} + T_{sump}$, recited in Claims 34 and 36 is a thermal model and that this expression does not match the thermal model of paragraph [0027]. The expression $\frac{H_R}{K_{diss}} + T_{sump}$ is not a thermal model. As stated in paragraph [0027] of the application, the thermal model which includes the equation $T_{C\,deriv} = \left(\frac{1}{M_{friction\,device}}\right)\left(H_R - K_{diss}\left(T_C - T_{sump}\right)\right)$ functions as a low pass filter that tracks the value of $\frac{H_R}{K_{diss}} + T_{sump}$ with a time constant equal to $\frac{M_{friction\,device}}{K_{diss}}$. Claims 34 and 36 do not recite a thermal model that includes the expression $\frac{H_R}{K_{diss}} + T_{sump}$, but recite how the thermal model functions as a low-pass filter that tracks the expression or value $\frac{H_R}{K_{diss}} + T_{sump}$. Thus, Claims 34 and 36 do not contradict the thermal model recited in paragraph [0027] of the application.

Therefore, reconsideration and withdrawal of the 35 U.S.C. 112 rejections are respectfully requested.

REJECTION UNDER 35 U.S.C. § 102

Claims 1, 3-6, 9, 10, 12-14, 19-21, 32, 37, 38, and 40 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 5,319,963 ("Benford"). This rejection is respectfully traversed.

Claim 1 recites:

"A cooling system for cooling a friction device, comprising:

a flow control device that controls a flow of cooling fluid through said friction device; and

a controller configured to estimate at least one temperature state that includes a bulk friction device temperature of said friction device based on an estimated heat rate of said friction device,

wherein said controller is configured to calculate a flow command based on said at least one temperature state and operates said flow control device based on said flow command,

wherein said controller is configured to determine at least one of approximate thermal inertia of said friction device and heat rejection of at least one of said friction device and said cooling system, and

wherein said controller is configured to estimate said at least one temperature state based on at least one of said approximate thermal inertia and said heat rejection."

Benford does not show, teach, or suggest a controller configured to estimate at least one temperature state that includes a bulk friction device temperature of a friction device based on an estimated heat rate of the friction device, as recited in Claim 1.

The Examiner alleges that step 24 of Benford discloses estimating a temperature of a friction device. Applicant disagrees. Step 24 of Benford is associated with calculating a "cooler-in" temperature. The cooler-in temperature refers to a temperature of a fluid entering a transmission fluid cooler. See col. 6, line 67-col. 7, line 2 of Benford. Benford does not appear to estimate a temperature of a friction device, such as a clutch of a transmission.

Also, Benford does not estimate heat rate of a friction device. Applicant is unable to find the term "heat rate" or the term "heat transfer rate" anywhere in Benford.

In addition and with respect to Claim 1, Benford does not disclose a controller that is configured to: i) determine at least one of approximate thermal inertia of a friction device and heat rejection of at least one of the friction device and a cooling system; and ii) estimate a temperature state of the friction device based on at least one of the

approximate thermal inertia and the heat rejection. As Benford does not disclose determining a temperature state of a friction device, Benford does not disclose item ii.

In addition, the Examiner alleges that step 26a of Benford discloses determining heat rejection. Applicant notes that step 26a is determined subsequent to step 24 and thus the temperature determined in step 24 is not based on the heat rejection determined in step 26a. Applicant further notes that the heat rejection of step 26a is directed to heat rejection of an engine, whereas the temperature of step 24 is directed to temperature of a cooler of a transmission. Thus, the heat rejection of step 26a and the temperature of step 24 are not directed to the same device. For at least the above reasons, Benford further does not disclose item ii.

Claim 10 recites a method that includes: I) determining a loop time of a thermal model of a friction device; and II) estimating a temperature state of a component of the friction device based on the loop time.

The Examiner alleges that col. 5, lines 50-65 of Benford disclose a loop time. Applicant disagrees. Col. 5, lines 50-65 discloses a calculation time interval. The calculation time interval appears to be a set time (or fixed stored time) of, for example, 1.8 seconds, as stated in col. 5, lines 50-65. Thus, Benford does not appear to determine a loop time, which may vary in length and is not a fixed stored value.

Also, the calculation time interval of Benford appears to be time period between calculating a current transmission oil sump temperature T_0 and calculating a previous transmission oil sump temperature $T_0(i-1)$. A sump refers to a reservoir where oil of a transmission is collected. Calculating sump temperature is not the same as calculating

temperature of a friction device, such as temperature of a clutch. A sump temperature can be substantially different than temperature of a clutch.

Furthermore, transmission oil is not a friction device that includes components. Transmission oil is used to cool friction devices and components. Thus, Benford does not disclose estimating a temperature state of a component of a friction device based on loop time.

Therefore, Benford does not disclose each and every element of Claims 1 and 10.

The Court of Appeals for the Federal Circuit has recently stated: "We thus hold that unless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. §102...." *Net MoneyIN Inc. v. VeriSign Inc.*, 88 USPQ2d 1751, 1759-1760 (Fed. Cir. 2008).

Therefore, Claims 1 and 10 are allowable for at least the above reasons. Claim 20 and 34 are allowable for at least similar reasons. Claims 3-6, 9, 12-14, 19-21, 32-33 and 36-42 ultimately depend from Claim 1 and are allowable for at least similar reasons.

REJECTION UNDER 35 U.S.C. § 103

Claims 33, 34, 36, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Benford. This rejection is respectfully traversed.

Claims 33 and 39 ultimately depend from Claims 1 and 20 and are allowable for at least the above reasons.

Claim 34 recites a controller that: A) estimates at least one temperature state that includes a bulk friction device temperature of a friction device based on an estimated heat rate of the friction device; and B) estimates the at least one temperature state based on at least one of an approximate thermal inertia of the friction device and heat rejection of at least one of the friction device and a cooling system.

Applicant has shown above that Benford does not disclose features A and B. Thus, Benford does not disclose each and every element of Claim 34.

Claim 34 further recites that the temperature state is based on a thermal model of the friction device and the thermal model performs as a low-pass filter. The low-pass filter tracks $\frac{H_R}{K_{diss}} + T_{sump}$, where H_R is the heat rate, K_{diss} is heat rejection of the friction device, and T_{sump} is a sump temperature.

The Examiner admits that Benford does not disclose the expression $\frac{H_R}{K_{diss}} + T_{sump}$, but that it would have been obvious to modify the formula provided in col. 5, line 55 of Benford to provide this feature. Applicant disagrees.

The formula in col. 5, line 55 of Benford is not a thermal model of a friction device, but rather is a calculation of a transmission oil sump temperature. Benford does not disclose a thermal model of a friction device. Furthermore, there is no suggestion in Benford that the formula in col. 5, line 55 performs as a low-pass filter.

Also, the parameters in the formula in col. 5, line 55 of Benford are different than the parameters in Claim 34. The formula of Benford includes torque converter heat flow q_{TC}, transmission heat flow q_T, transmission cooler heat flow q_C, exterior of transmission

heat flow q_X, and thermal inertia M_{TH}. None of these parameters are included in the expression $\frac{H_R}{K_{diss}} + T_{sump}$.

In addition, Benford does not disclose H_R (heat rate). Applicant is unable to find this parameter anywhere in Benford. Moreover, the formula in col. 5, line 55 does not include H_R (heat rate) and/or K_{diss} (heat rejection of a friction device).

Therefore, Claim 34 has limitations not taught by either reference.

It is a longstanding rule that to establish a prima facie case of obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 143 (CCPA 1974). *See* MPEP § 2143.03. For at least the above reasons, Applicant respectfully asserts that Claim 34 defines over the cited art.

Claim 36 depends from Claim 34 and is allowable for at least similar reasons.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: 5/10/2010

By: _____
Michael D. Wiggins
Reg. No. 34,754

Jeffrey J. Chapp
Reg. No. 50,579

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

MDW/JJC/ma